

CLAIMS

1. A haptic feedback remote control device for providing control signals to a toy device to control the operation of said toy device, the control device comprising:

5 a housing;

at least one control for manual manipulation by said user, wherein said control signals representing said manipulation are sent to said toy device to control said operation of said toy device;

10 an actuator coupled to said housing, said actuator outputting forces on said housing or said at least one control in response to received actuator signals; and

15 a controller electrically coupled to said actuator, said controller providing said actuator signals to said actuator and monitoring said control signals representing said manipulation of said at least one control, wherein said controller determines said actuator signals based at least in part on said manual manipulation of said at least one control by said user.

2. A haptic feedback remote control device as recited in claim 1 wherein said controller determines said actuator signals based only on said manual manipulation of said at least one control by said user.

20 3. A haptic feedback remote control device as recited in claim 1 wherein said forces are output on said housing, wherein said actuator moves an inertial mass to provide inertial haptic sensations on said housing, said inertial haptic sensations being felt by said user.

4. A haptic feedback remote control device as recited in claim 1 wherein said force are output on said at least one control, wherein said at least one control includes a lever movable along an axis.

25 5. A haptic feedback remote control device as recited in claim 1 wherein said control signals sent to said toy device are transmitted wirelessly to said toy device.

6. A haptic feedback remote control device as recited in claim 5 wherein said control signals are transmitted as RF signals.

7. A haptic feedback remote control device as recited in claim 1 wherein said controller determines said actuator signals also based on information received from said toy device.

8. A haptic feedback remote control device as recited in claim 7 wherein said information received from said toy device includes information from a contact sensor on said toy device, said information indicating whether said toy device has contacted with another object at a location of said contact sensor.

9. A haptic feedback remote control device as recited in claim 8 wherein said information indicates a degree of contact of said toy device with said other object.

10. A haptic feedback remote control device as recited in claim 7 wherein said information indicates an amount of acceleration experienced by said toy device in at least one dimension of said toy device.

11. A haptic feedback remote control device as recited in claim 1 wherein said at least one control manipulated by said user includes a throttle control that determines a speed of travel of said toy device, wherein a magnitude of said forces is correlated with a setting of said throttle control.

12. A haptic feedback remote control device as recited in claim 1 wherein said at least one control manipulated by said user includes a turning control that determines a direction of travel of said toy device, wherein a magnitude or frequency of said forces is correlated with a setting of said turning control.

13. A haptic feedback remote control device as recited in claim 1 wherein said toy device is a toy car.

14. A haptic feedback remote control device for providing control signals to a toy device to control the operation of said toy device, the control device comprising:

a housing;

at least one control for manual manipulation by said user, wherein said control signals representing said manipulation are sent to said toy device to control said operation of said toy device;

an actuator coupled to said at least one control, said actuator outputting forces on said housing or said at least one control in response to received actuator signals; and

a controller electrically coupled to said actuator, said controller providing said actuator signals to said actuator and monitoring said control signals representing said manipulation of said at least one control, wherein said controller determines said actuator signals based at least in part on information received from said toy device.

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15. A haptic feedback remote control device as recited in claim 14 wherein said controller determines said forces based at least in part on said manual manipulation of said at least one control by said user.

10 16. A haptic feedback remote control device as recited in claim 14 wherein said actuator outputs inertial forces on said housing by moving an inertial mass.

17. A haptic feedback remote control device as recited in claim 14 wherein said at least one control includes a lever movable in one degree of freedom, wherein said actuator outputs forces in said degree of freedom.

18. A haptic feedback remote control device as recited in claim 14 wherein said controller determines said forces also based on information received from said toy device.

19. A haptic feedback remote control device as recited in claim 18 wherein said information received from said toy device includes information from a contact sensor on said toy device, said information indicating whether said toy device has contacted with another object at a location of said contact sensor.

20. A haptic feedback remote control device as recited in claim 18 wherein said information indicates an amount of acceleration experienced by said toy device in at least one dimension of said toy device.

21. A haptic feedback remote control device for providing control signals to a toy device to control the operation of said toy device, the control device comprising:

housing means;

at least one control means for manual manipulation by said user, wherein said control signals representing said manipulation are sent to said toy device to control said operation of said toy device;

actuation means for outputting forces on said housing means or said control means in response to received actuator signals; and

control means for providing said actuator signals to said actuator and for monitoring said control signals representing said manipulation of said at least one control, wherein said controller determines said actuator signals based at least in part on said manual manipulation of said at least one control means.

22. A haptic feedback remote control device as recited in claim 21 wherein said control means determines said actuator signals also based on information received from said toy device.

23. A haptic feedback remote control device as recited in claim 21 wherein said control means determines said actuator signals only based on said manual manipulation of said at least one control means.

24. A haptic feedback remote control device as recited in claim 22 wherein said information received from said toy device includes information from contact sensor means on said toy device, said information indicating whether said toy device has contacted with another object at a location of said contact sensor means.

25. A remote control toy device providing haptic feedback to a user, the toy device comprising:

a remote control unit for providing control signals, said remote control unit including:

a housing,

a control manually manipulable by said user,

an actuator coupled to said housing, said actuator outputting forces on said housing or on said control in response to received actuator signals, and

a controller operative to provide said actuator signals to said actuator and to monitor said control signals representing said manipulation of said at least one control; and

a toy device operable to physically move in accordance with said control signals received from said remote control unit.

26. A remote control toy device as recited in claim 25, wherein said controller determines said actuator signals based at least in part on said manual manipulation of said control.

5 27. A remote control toy device as recited in claim 25 wherein said toy device further includes a sensor for determining an interaction or action of said toy device, wherein information representative of said interaction or action is sent to said remote control unit.

10 28. A remote control toy device as recited in claim 27 wherein said sensor detects contact of said toy device with another object, wherein said information informs said remote control unit of said contact.

29. A remote control toy device as recited in claim 28 wherein said sensor detects a degree of contact of said toy device with another object, wherein said information informs said remote control unit of said degree of contact.

15 30. A remote control toy device as recited in claim 27 wherein said sensor is an accelerometer that detects an acceleration on said toy device, wherein said information informs said remote control unit of said acceleration.

31. A method for controlling a toy device based on manipulation of a remote control unit by a user and for providing haptic sensations to the user, the method comprising:

20 providing control signals to said toy device based on manual manipulation of at least one control on said remote control unit by said user, wherein said control signals control the operation of said toy device;

receiving status signals from said toy device, said status signals indicating a current status of said toy device; and

25 causing haptic sensations to be output on said remote control unit, said haptic sensations based on at least one of said manual manipulation of said at least one control and said status signals received from said toy device.

32. A method as recited in claim 31 wherein said actuator moves an inertial mass to provide inertial haptic sensations on a housing of said remote control unit.

33. A method as recited in claim 31 wherein said at least one control includes a lever movable along an axis.

5 34. A method as recited in claim 31 wherein said control signals sent to said toy device and said status signals received from said toy device are communicated wirelessly.

35. A method as recited in claim 31 wherein said status signals received from said toy device include information from a contact sensor on said toy device, said information indicating whether said toy device has contacted with another object at a location of said contact sensor.

10 36. A method as recited in claim 31 wherein said status signals received from said toy device include information indicating an amount of acceleration experienced by said toy device in at least one dimension of said toy device.